

**Notice of Allowability**

Application No.

10/720,430

Examiner

Christopher Verdier

Applicant(s)

LOWE ET AL.

Art Unit

3745

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to Applicant's Amendment dated 6-22-06.
2. ☒ The allowed claim(s) is/are 7-9, 18, 19, 21, 22 and 30-35.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☐ All    b) ☐ Some\*    c) ☐ None    of the:
  1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
  - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
    - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
  - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date \_\_\_\_\_
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date \_\_\_\_\_
7. ☒ Examiner's Amendment/Comment
8. ☐ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_.

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### EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Steven Rosen, Attorney of Record, on July 7, 2006.

The application has been amended as follows:

In the Claims: Claims 7, 18, 19, 21, and 30 are amended as follows:

-- Claim 7. (currently amended) ~~A cooling element as claimed in Claim 1 wherein the cooling element is a baffle and the cooling apertures are impingement apertures.~~ A turbine shroud assembly cooling element comprising:

an arcuate turbine shroud panel circumscribed about an axis of rotation and having opposite axially spaced apart forward and aft ends,

a plurality of cooling apertures extending through the panel,

an axially extending midline of the panel parallel to the axis of rotation wherein the cooling element is a baffle and the cooling apertures are impingement apertures,

a symmetric portion of the cooling apertures having a symmetrical density of aperture inlets that is symmetric with respect to the axially extending midline, and

an asymmetric portion of the cooling apertures having an asymmetrical density of aperture inlets that is asymmetric with respect to the axially extending midline. --

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-- Claim 18. (currently amended) ~~A cooling element as claimed in Claim 17 wherein~~ A turbine shroud assembly cooling element comprising:

an arcuate turbine shroud panel circumscribing an axis of rotation and having opposite axially spaced apart forward and aft ends,

a plurality of cooling apertures extending through the panel,

an axially extending midline of the panel parallel to the axis of rotation,

a symmetric portion of the cooling apertures having a symmetrical density of aperture inlets being symmetric with respect to the axially extending midline,

an asymmetric portion of the cooling apertures having an asymmetrical density of aperture inlets being asymmetric with respect to the axially extending midline,

the cooling element being a shroud segment, the arcuate panel being a base, and the cooling apertures being convection cooling apertures,

a high density area of the convection cooling apertures in the asymmetric portion of the convection cooling apertures,

the high density area having a higher density of aperture inlets than in the symmetric portion of the convection cooling apertures,

a low density area of the convection cooling apertures in the asymmetric portion of the convection cooling apertures,

the low density area having a lower density of aperture inlets than in the symmetric portion of the convection cooling apertures,

a first portion of the convection cooling apertures being axially angled forwardly with respect to the axis of rotation,

a second portion of the convection cooling apertures being axially angled rearwardly with respect to the axis of rotation, and

a third portion of the convection cooling apertures are being circumferentially angled in a clockwise direction with respect to the midline of the base. --

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-- Claim 19. (currently amended) ~~A cooling element as claimed in Claim 17 wherein~~ A turbine shroud assembly cooling element comprising:

an arcuate turbine shroud panel circumscribing an axis of rotation and having opposite axially spaced apart forward and aft ends,

a plurality of cooling apertures extending through the panel,

an axially extending midline of the panel parallel to the axis of rotation,

a symmetric portion of the cooling apertures having a symmetrical density of aperture inlets being symmetric with respect to the axially extending midline,

an asymmetric portion of the cooling apertures having an asymmetrical density of aperture inlets being asymmetric with respect to the axially extending midline,

the cooling element being a shroud segment, the arcuate panel being a base, and the cooling apertures being convection cooling apertures,

a high density area of the convection cooling apertures in the asymmetric portion of the convection cooling apertures,

the high density area having a higher density of aperture inlets than in the symmetric portion of the convection cooling apertures,

a low density area of the convection cooling apertures in the asymmetric portion of the convection cooling apertures,

the low density area having a lower density of aperture inlets than in the symmetric portion of the convection cooling apertures,

a first portion of the convection cooling apertures being axially angled forwardly with respect to the axis of rotation,

a second portion of the convection cooling apertures being axially angled rearwardly with respect to the axis of rotation, and

a fourth portion of the convection cooling apertures are being circumferentially angled in a counter-clockwise direction with respect to the midline of the base. --

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-- Claim 21. (currently amended) ~~An assembly as claimed in Claim 20 further comprising~~ A turbine shroud assembly comprising:

a plurality of arcuate shroud segments circumferentially disposed about an engine centerline axis,

each of the shroud segments including a base having a radially outer back surface, a radially inner front surface, and opposite axially spaced apart upstream and downstream ends,

a plurality of angled elongated convection cooling apertures extending through the base with convection aperture inlets at the back surface and aperture outlets at the radially inner front surface,

a plurality of arcuate hanger segments supporting the shroud segments and secured to a gas turbine engine outer casing,

a shroud chamber radially disposed between each of the hanger segments and bases,

a pan-shaped baffle radially disposed in the shroud chamber between each of the hanger segments and bases and defining a baffle plenum in the shroud chamber and radially outwardly of the baffle,

a metering hole disposed through each of the hanger segments and leading to the baffle plenum,

a plurality of impingement apertures having impingement aperture inlets through a panel of the baffle and generally oriented towards the base, the panel being radially spaced apart from and generally concentric with the base,

parallel axially extending midlines of the panel and the base, the midlines being parallel to the engine centerline axis,

asymmetric portions of the cooling apertures having asymmetrical densities of aperture inlets that are asymmetric with respect to the axially extending midlines,

a high density area of the impingement apertures in the asymmetric portion of the impingement apertures, and

the high density area having a higher density of aperture inlets than in a symmetric portion of the impingement apertures. --

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-- Claim 30. (currently amended) A turbine shroud assembly comprising:

a plurality of arcuate shroud segments circumferentially disposed about an engine centerline axis,

each of the shroud segments including a base having a radially outer back surface, a radially inner front surface, and opposite axially spaced apart upstream and downstream ends,

a plurality of angled elongated convection cooling apertures extending through the base with convection aperture inlets at the back surface and aperture outlets at the radially inner front surface,

~~the high density area of the convection cooling apertures located in a wake region of the arcuate panel of the shroud segment,~~

a plurality of arcuate hanger segments supporting the shroud segments and secured to a gas turbine engine outer casing,

a shroud chamber radially disposed between each of the hanger segments and bases,

a pan-shaped baffle radially disposed in the shroud chamber between each of the hanger segments and bases and defining a baffle plenum in the shroud chamber and radially outwardly of the baffle,

a metering hole disposed through each of the hanger segments and leading to the baffle plenum,

a plurality of impingement apertures having impingement aperture inlets through a panel of the baffle and generally oriented towards the base, the panel being radially spaced apart from and generally concentric with the base,

parallel axially extending midlines of the panel and the base, the midlines being parallel to the engine centerline axis,

asymmetric portions of the cooling apertures having asymmetrical densities of aperture inlets that are asymmetric with respect to the axially extending midlines, and

a high density area of the impingement apertures in the asymmetric portion of the impingement apertures and the high density area having a higher density of aperture inlets than in a symmetric portion of the impingement apertures, and

a high density area of the convection cooling apertures located in a wake region of the arcuate panel of the shroud segment. --

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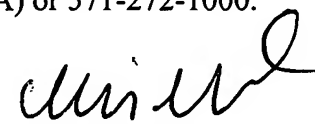
The above changes to claims 7, 18, 19, and 21 have been made in order to comply with 37 CFR 1.121. The above change to claim 30 has been made to correct an informality therein. It is noted that Applicant rewrote claims 7, 18, 19, and 21 in independent form to include the allowable subject matter indicated in the Office action of March 13, 2006.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher Verdier whose telephone number is (571) 272-4824. The examiner can normally be reached on Monday-Friday from 10:00-6:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward K. Look can be reached on (571) 272-4820. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

C.V.  
July 7, 2006



Christopher Verdier  
Primary Examiner  
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